Claims

1. A method of enhancing the immune response to an immunogen in a mammal, wherein said method comprises providing to said mammal the following polypeptides:

(a) an immunogen;

(b) Flt3L or a biologically active fragment thereof; and

(c) MIP-1α or a biologically active fragment thereof.

2. A method of enhancing the immune response to an immunogen in a mammal, wherein said method comprises providing to said mammal the following polypeptides:

(a) an immunogen;

(b) Flt3L or a biologically active fragment thereof; and

(c) MIP-1α or a biologically active fragment thereof,

wherein at least one of said polypeptides is provided as a nucleic acid molecule.

3. A method for enhancing the immune response to an immunogen in a mammal, wherein said method comprises providing to said mammal the following polypeptides:

(a) an immunogen;

(b) Flt-3L or a biologically active fragment thereof; and

(c) MIP-3α or a biologically active fragment thereof.

4. A method of enhancing the immune response to an immunogen in a mammal, wherein said method comprises providing to said mammal the following polypeptides:

(a) an immunogen;

(b) Flt-3L or a biologically active fragment thereof; and

(c) MIP-3α or a biologically active fragment thereof,

wherein at least one of said polypeptide is provided as a nucleic acid molecule.

5. The method of claim 1 or 2, wherein said Flt3L and said MIP-1α are provided in a therapeutically effective amount to augment the T cell response, wherein said T cell response is CD4+ T cell response, CD8+ T cell response, or both.

6. The method of claim 3 or 4, wherein said Flt3L and said MIP-3α are provided in a therapeutically effective amount to augment the T cell response, wherein said T cell response is CD4+ T cell response, CD8+ T cell response, or both.

7. The method of claim 5 or 6, wherein said T cell response is augmented by at least 20% relative to an untreated control.

8. The method of claim 6, wherein said T cell response is augmented by at least 40% relative to an untreated control.

9. The method of any one of claims 1-4, wherein said Flt-3L polypeptide or biologically active fragment thereof is a human, mouse, rat, or monkey polypeptide.

10. The method of claim 1 or 2, wherein said MIP-1α polypeptide or biologically active fragment thereof is a human, mouse, rat, or monkey polypeptide.

11. The method of claim 3 or 4, wherein said MIP-3α polypeptide or biologically active fragment thereof is a human, mouse, rat, or monkey polypeptide.

12. The method of any one of claims 1-4, wherein said Flt-3L polypeptide is the full length Flt-3L polypeptide.

13. The method of claim 1 or 2, wherein said MIP-1α polypeptide is the full length MIP-1α polypeptide.

14. The method of claim 3 or 4, wherein said MIP-3α polypeptide is the full length MIP-3α polypeptide.

15. The method of any one of claims 1-4, wherein an additional adjuvant is further administered to said mammal.

16. The method of claim 15, wherein said adjuvant is GM-CSF or a biologically active fragment thereof.

17. The method of any one of claims 1-4, wherein at least two immunogens are provided to said mammal.

18. The method of any one of claims 1-4, wherein said polypeptides are provided within no more than 20 cm apart on the surface of the skin of said mammal.

19. The method of any one of claims 1-4, wherein said mammal is a human.

20. The method of any one of claims 1-4, wherein said mammal is a neonate.

21. The method of claim 20, wherein said method is to prevent viral transmission during breastfeeding.

22. The method of any one of claims 1-4, wherein said method is used to treat or prevent microbial infections.

23. The method of claim 22, wherein said method further comprises a second anti-microbial therapeutic regimen.

24. The method of claim 23, wherein said second therapeutic regimen is administered within one week before or after said providing.

25. The method of claim 22, wherein said microbial infection is bacterial, viral, fungal, or parasitic.

26. The method of claim 25, wherein said viral infection is an HIV infection.

27. The method of claim 22, wherein an antigen substantially identical to said immunogen is present in microbial infections.

28. The method of claim 22, wherein said antigen is gp160, p24 VLP, gp41, p31, p55, gp120, Tat, gag, pol, env, nef, rev, or VaxSyn.

29. The method of any one of claims 1-4, wherein said method is used to treat or prevent autoimmune disease, tissue rejection, or allergic reaction.

30. The method of claim 29, wherein said method further comprises a second therapeutic regimen.

31. The method of claim 30, wherein said second therapeutic regimen is administered within one week before or after said providing.

32. The method of claim 29, wherein an antigen substantially identical to said immunogen is present in autoimmune disease, tissue rejection, or allergic reaction.

33. The method of any one of claims 1-4, wherein said method is used to prevent or treat cancer.

34. The method of claim 33, wherein said method further comprises a second anti-cancer therapeutic regimen.

35. The method of claim 34, wherein said second anti-cancer therapeutic regimen is administered within one week before or after said providing.

36. The method of claim 33, wherein said cancer is selected from the group consisting of melanoma, breast, pancreatic, colon, lung, glioma, hepatocellular, endometrial, gastric, intestinal, renal, prostate, thyroid, ovarian, testicular, liver, head and neck, colorectal, esophagus, stomach, eye, bladder, glioblastoma, and metastatic carcinoma.

37. The method of claim 33, wherein an antigen substantially identical to said immunogen is present in cancer.

38. The method of claim 37, wherein said antigen is selected from the group consisting of Melan-A, tyrosinase, p97, β-HCG, GalNAc, MAGE-1, MAGE-2, MAGE-3, MAGE-4, MAGE-12, MART-1, MUC1, MUC2, MUC3, MUC4, MUC18, CEA, DDC, melanoma antigen gp75, Hker 8, high molecular weight melanoma antigen, K19, Tyr1 and Tyr2, members of the pMel 17 gene family, c-Met, PSA, PSM, α-fetoprotein, thyroperoxidase, gp1000, NY-ESO-1, telomerase, C25 colon carcinoma, and p53.

39. The method of any one of claims 1-4, wherein said method is used to substantially reduce the dosage of vaccine required to enhance the immune response in said mammal.

40. The method of any one of claims 1-4, wherein said polypeptides are provided in the same formulation.

41. The method of any one of claims 1-4, wherein said polypeptides are provided in at least two separate formulations.

42. The method of claim 41, wherein said polypeptides are provided by the same route of administration.

43. The method of any one of claims 1-4, wherein said polypeptides are suitable for injection intradermally, intramuscularly, subcutaneously, or intravenously.

44. The method of claim 1 or 2, wherein at least one of said polypeptides is provided to said mammal by providing at least one expression vector comprising a polynucleotide sequence operably linked to regulatory elements, wherein said polynucleotide sequence encodes:

a) an immunogen;

b) MIP-1α or a biologically active fragment thereof; or

c) Flt3L or a biologically active fragment thereof.

45. The method of claim 3 or 4, wherein at least one of said polypeptides is provided to said mammal by providing at least one expression vector comprising a polynucleotide sequence operably linked to regulatory elements, wherein said polynucleotide sequence encodes:

a) an immunogen;

b) MIP-3α or a biologically active fragment thereof; or

c) Flt3L or a biologically active fragment thereof.

46. The method of claim 44 or 45, wherein said expression vector is a viral, bacterial, or a plasmid vector.

47. The method of claim 46, wherein said viral vector is selected from the group comprising of an adenovirus, poxvirus, and lentivirus.

48. The method of claim 44 or 45, wherein at least 0.2 ug of expression vector is provided.

49. The method of any one of claims 1-4, wherein said method further comprises administering a booster shot to said mammal.

50. The method of claim 49, wherein said booster shot is administered within a year of said providing.

51. The method of claim 49, wherein said booster shot comprises providing to said mammal one or more immunogens.

52. The method of claim 49, wherein said booster shot comprises providing to said mammal MIP-1α, Flt3L, MIP-3α, or a combination thereof in a therapeutically effective amount.

53. The method of claim 49, wherein said MIP-1α and Flt-3 are provided.

54. The method of claim 49, wherein said MIP-3α and Flt-3 are provided.

55. The method of claim 49, wherein said MIP-3α, MIP-1α, and Flt-3 are provided.

56. The method of claim 49, wherein said booster shot is a recombinant vector comprising a polynucleotide sequence operably linked to regulatory elements encoding said immunogen.

57. The method of claim 56, wherein said recombinant vector is a live recombinant vector selected from a group consisting of an adenovirus, a lentivirus, or a poxvirus.

58. The method of claim 57, wherein said poxvirus is modified vaccinia virus Ankara, or fowl pox.

59. The method of claim 56, wherein at least 0.2 ug of recombinant vector is provided.

60. The method of claim 57, wherein at least 10^5pfu of live recombinant vector is provided.

61. The method of claim 49, wherein said booster shot results in at least a 2-fold increase in the T cell response in said mammal compared to the T cell response in a control mammal provided not provided with booster shot, wherein said T cell response is CD4+ T cell response, CD8+ T cell response, or both.

62. The method of claim 49, wherein said polypeptides and said booster shot are provided by the same route of administration.

63. The method of claim 49, wherein said polypeptides and said booster shot are provided no more than 20 cm apart on the surface of said mammal.

64. The method of claim 49, wherein said booster shot is suitable for injection intradermally, intramuscularly, subcutaneously, or intravenously.